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ENLIGHTENMENT ON NAEGLERIA FOWLERI; A BRAIN EATING AMOEBA- AN ALARMING CALL

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ABSTRACT

Naegleria fowleri is also called as brain eating amoeba. It is a very dangerous and life threatening disorder that cause PAM (primary amebic meningoencephalitis). The ultimate source of Naegleria is contaminated water or water with poor chlorine level. It is usually examined under CT scan, PCR and CSF. According to research, there is increasing number of PAM in Karachi,Pakistan. The purpose of this core study or review is to give awareness and provide its better management in the light of different updated new studies

Key words: Naegleria fowleri, Primary Amebic Meningoencephalitis (PAM), Brain Eating Amoeba, Karachi, Pakistan.

Introduction:
Naegleria fowleri is a species of kingdom protista which is free living commonly called as brain eating amoeba that can cause unique but disastrous infection known as primary amebic meningoencephalitis (PAM) this infection is also called as Naeglariasis. The ameba lives in warm fresh water (rivers, lakes) and soil. It is a single celled eukaryotic organism. People usually infected from either contaminated water or not then this water enters in body through nose then Naegleria enters in brain that causes PAM.

History:
In Australia 1965 Dr fowler and cutler 1st described the disease caused by amoeba flagellate. He described that amoeba flagellate is a free living organism, lives in both environment in human causing PAM. Almost 144 cases from all over the world identified. Dr Fowler and cutler named this organism N fowleri.[1,2]

Naegleria fowleri life cycle:
There are 3 main stages of n fowleri life cycle:
1) Trophozoites (feeding)
2) Flagellate (motility)
3) Cysts (surviving)

In these stages trophozoites stage is an infective stage. During binary fission trophozoites replicate and their nuclear membrane remains intact. Trophozoites infect people and animal when enters through nose (nasal tissue) and then migrate into brain causing primary amoebic meningoencephalitis (PAM). Trophozoites found in CSF and as well as in tissue. When there are unfavorable condition trophozoites convert into flagellate and then form cysts. It is resistant and increases the chances of survival [3]

Figure 1: Life cycle of Naegleria

Causing illness:
Naegleria fowleri cause primary amoebic meningoencephalitis resulting bleeding.[4] Primary amoebic meningoencephalitis due is hazardous, necrotizing, and hemorrhagic meningoencephalitis, characterized by severe headache, stiff neck, fever (38.5°C–41°C), altered mental status, seizures, and coma, leading to death [5,6,7,8]

Signs and symptoms:
Sign and symptoms begin after the exposure to Naegleria containing water. It is divided into 2 stages.

Stage 1 sign and symptoms: fever, nausea, vomiting and a severe frontal headache. (Mild symptoms)

Stage 2 sign and symptoms: stiff neck, altered mental status, hallucinations, seizures, and coma. (Severe symptoms) [9-11]

Epidemiology:
Pakistan is also victim of this disease. 20deaths reported in Karachi in 2010. [12] In 2011, 13more cases reported in Karachi.[13] In 2014 one more case reported which was very fatal.[14] In April 2015, 5 more deaths occur in Karachi. [15] In May 2015, 4 another cases is reported. [16] Accorng to this research there is increasing number of cases in Karachi.

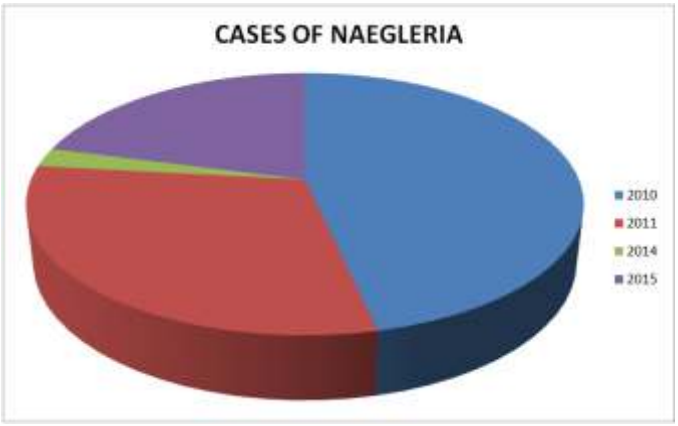

Figure 2: Proportions and incidents of Naegleria over the recent years

Diagnosis:
PAM is diagnosed by the help of biopsy, CSF or tissue specimens either organism or nucleic acid of Naegleria is detected.

CSF:
A fresh CSF is taken and sediment it but it should be fresh, unrefrigerated, unfrozen, so after sedimentation trophozoites of Naegleria seen in microscope. CSF may correlate with degree of inflammation and necrosis present. It may be grayish or yellowish color. In CSF analysis of Naegleria patient elevated protein level, elevated neutrophilic pleocytosis, hypoglycorrhachia, GS and LA were negative observed.

PCR:
PCR is used to identify Naegleria fowleri. PCR is amplification of DNA. It is a scientific technique in molecular biology. (17, 18) Through PCR trophozoites and cysts of Naegleria fowleri is identified.

CT scan:
CT scan is used to identify the structure of brain in Naegleria fowleri. It is used to identify either lesions or not.

Treatment:

Drug name	Category	Mechanism of action	Indications	Side effects
Amphotericin B	Antifungal	Bind with sterols of fungal membrane and Naegleria fowleri leads to cell death	Zygomycosis,PAM, systemic candidiasis, coccidioidomycosis, histoplasmosis	Diarrhea, nausea, chills, vomiting, malaise
Rifampicin	Enzyme inhibitors	Inhibits the DNA dependent RNA polymerase leading to cell death.	Mycobacterial infections	Heartburn, nausea, drowsiness, dizziness.
Sulfadiazine	Sulphonamides	Inhibit the bacterial enzyme	Meningococcal meningitis	Nausea, vomiting, diarrhea, headache

IMMUNIZTION AGAINST NAEGLERIA FOWLERI:
Naegleria as we discussed above is the causal agent of PAM in humans. There is no any sign of acquired human immunity in human but mice shows specific antigens that mean mice develop immunization against n. fowleri. IgG antibodies detect in ICR mice against Naegleria fowleri. [20,21]

Humoral immunity is not enough so considerable endeavor has been made to show that mice can be immunized through intraperitoneal inoculation of live or dead amoeba by formalin fixation.[22] NFa1 protein immunized intraperitoneally and intra nasally in mice which shows serological response through this response high level of NFa1-specific IgG, including IgG2b, IgG2a and IgG3, and IgA antibodies developed.[23] NFa1 protein immunized in mice against Naegleria using mucosal and result shows that there is increase serum level of IgG antibodies in mice infected with PAM due to Naegleria fowleri.[24] Further more studies also conduct in experimental animals. [25- 27] our research group also did work on a variety of subjects to elevate the level of awareness, alertness and improve the health and well being of the citizen in a society [28-36]

Result and Discussion:
Naegleria fowleri is a hazardous to human life. According to research it is increasing day by day through water contagion. Mild symptoms convert into severe within couple of days. The best way to diagnose Naegleria is CSF, PCR and CT scan. Various drugs shows improvement in patients with PAM those medicines are Amphotericin B, Rifampicin and sulfadiazine. According to latest research many immunization test occur in mice and very prompt response against Naegleria is identified. Antibodies against Naegleria are formed in mice.So by now it can be manageable and curable up to some extent and by proper chlorination of water.The main task behind this collection of latest researches is to tackle this alarming disease and its proper management

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